BICYCLE STEM AND ASSOCIATED METHODS

Field of the Invention

The present invention relates to the field of bicycle components, and more particularly, to a bicycle stem for attaching handlebars to a steering tube.

Background of the Invention

Bicycles are widely used for transportation and recreation. A typical bicycle includes a rear wheel carried by a frame and a front wheel carried by a fork which, in turn, is rotatably connected to a forward portion of the frame. In particular, a steering tube is connected at its lower end to the fork and extends through a corresponding passageway defined in the forward portion of the frame. An upper portion of the steering tube is connected to a bicycle stem.

The bicycle stem includes a steering tube clamping portion which clamps to the upper end of the steering tube. A body portion extends generally forwardly and at an upward incline from the steering tube clamping portion and terminates in a handlebar clamping portion. Of course, the medial portion of the handlebars is connected to the handlebar clamping portion of the stem. The rider is thus able to steer the front wheel by turning the handlebars.

The stem is important for proper orientation and positioning of the rider relative to the bicycle. In addition, the stem is desirably relatively strong to

avoid potentially catastrophic failure, and is also desirably lightweight to reduce the burden on the rider. Mountain or off-road biking can put especially high demands on the strength of the stem. Road bikes may also place high demands in terms of strength and lightweight on the bicycle stem.

A typical bicycle stem includes a steering tube clamping portion that comprises a vertically oriented tubular portion defining a main passageway that receives the upper end of the steering tube therethrough. To secure the stem relative to the steering tube a clamp in the form of an elongate clamping member is positioned within a second passageway that extends transverse to the main passageway and which is offset therefrom. The clamp typically includes two cylindrical halves which can be urged together by a fastener, such as a bolt which extends along an axis defined by the cylindrical halves. More particularly, the cylindrical halves each include corresponding arcuate recesses which when properly aligned will press against an outer circumferential portion of the steering tube upon tightening of the bolt to thus clamp the bicycle stem to the steering tube. Such stems are shown, for example, in U.S. Patent Nos. 5,687,616 and 5,842,385.

Unfortunately, such a conventional clamp for the steering tube has relatively little surface area to contact the steering tube. The outermost ends may define contact points which bite into the steering tube, thus forming dimples in the metal steering tube. Such deformations of the metal steering tube are undesirable for a number of reasons. In addition, for a composite material steering tube an entirely different type of clamping arrangement may be needed to avoid causing damage in the composite material which may propagate to failure of the steering tube. Such

composite steering tubes are often used on high-end road bicycles, for example.

Brief Description of the Drawings

FIG. 1 is a side view of a clamp in accordance with a first embodiment of the invention.

FIG. 2 is a perspective view of the clamp as shown in FIG. 1.

FIG. 3 is a perspective view of a prior art clamp.

FIG. 4 is a perspective view of a clamp in accordance with a second embodiment of the invention.

FIG. 5 is a side view of the prior art clamp as shown in FIG. 3.

FIG. 6 is a side view of the clamp as shown in FIG. 4.

FIG. 7 is an end view of the prior art clamp as shown in FIG. 3.

FIG. 8 is an end view of the clamp as shown in FIG. 4.

FIG. 9 is a side view of a clamp in accordance with a third embodiment of the invention.

FIG. 10 is a perspective view of the clamp as shown in FIG. 9.

FIG. 11 is a perspective view of steering tube clamp portion of a bicycle stem illustrating a fourth embodiment of a clamp in accordance with the invention.

FIG. 12 is a perspective view of steering tube clamp portion of a bicycle stem illustrating a fifth embodiment of a clamp in accordance with the invention.

FIG. 13 is a top plan view of a bicycle stem in accordance with the present invention.

FIG. 14 is a perspective view of the bicycle stem as shown in FIG. 13.

FIG. 15 is a side view of the bicycle stem as shown in FIG. 13.

FIG. 16 is a perspective view of the bicycle stem as shown in FIG. 13.

FIG. 17 is a perspective view of the bicycle stem as shown in FIG. 13 and with the handlebar cap removed for clarity.

FIG. 18 is a perspective view of the bicycle stem as shown in FIG. 13.

FIG. 19 is a side view of the bicycle stem as shown in FIG. 13.

FIG. 20 is a side view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 21 is a top plan view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 22 is a perspective view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 23 is a perspective view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 24 is a top plan view of a handlebar clamp portion of the bicycle stem as shown in FIG. 13.

FIG. 25 is an end view of the bicycle stem as shown in FIG. 13.

FIG. 26 is a side view of the handlebar cap of the handlebar clamp as shown in FIG. 24.

FIG. 27 is an opposite end view from the end view of the bicycle stem from the view of FIG. 25.

FIG. 28 is a top plan view of a sixth embodiment of the clamp in accordance with the invention.

FIG. 29 is a side view of the clamp as shown in FIG. 28.

FIG. 30 is a rear view of the clamp as shown in FIG. 28.

FIG. 31 is a top plan view of a seventh embodiment of the clamp in accordance with the invention.

FIG. 32 is a side view of the clamp as shown in FIG. 31.

FIG. 33 is a rear view of the clamp as shown in FIG. 31.

FIG. 34 is a top plan view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 35 is a side view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

FIG. 36 is an end view of the bicycle stem as shown in FIG. 13 with the clamp and handlebar cap removed for clarity.

Detailed Description of the Preferred Embodiments

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

As shown in the drawing figures, the bicycle stem in accordance with the invention includes a steering tube clamping portion, a tubular body portion extending outwardly therefrom, and a handlebar clamping portion connected to the opposite end of the tubular body portion. One advantageous aspect of the invention

relates to the clamp used to secure the stem to the upper end of the steering tube.

A first embodiment of the clamp is shown in FIGS. 1 and 2 wherein a throughbore for receiving the bolt is offset from the axis defined by the two halves. In this embodiment, the two halves define a part of an imaginary cylinder; however, the halves are shaped such that the contact areas at the end portions define respective contact lines rather than points as in the prior art as shown in FIGS. 3, 5, and 7, for example. A second embodiment of the clamp is shown in FIGS. 4, 6, and 8 wherein the contacting or wing portions extend further outwardly than the first embodiment.

In the third clamp embodiment shown in FIGS. 9 and 10, the two halves define an imaginary cylinder and the wing portions are defined by rounded portions of the halves separated by the medial recess.

Turning now to FIGS. 11 and 12, two mounting arrangements for a clamp, such as shown in FIGS. 1 and 2, are now described. The stem includes a transverse passageway to receive the clamp. As shown in FIG. 11, the transverse passageway may have a partially round shape with a flat thereon in the direction toward the steering tube. FIG. 12 illustrates a completely round cross-section for the transverse passageway. The wall portions defining the passageway preferably include a shape to receive the clamp in an at least partially aligned manner. Indeed the transverse passageway and clamp may be corresponding shaped to define a key for proper orientation of the clamp. For example, the clamp and passageway may be generally rectangular or define other polygons, such as a trapezoid, for example. Of course, the cylindrical arrangement may simplify manufacturing.

FIGS. 13-16, for example, illustrate an embodiment of the bicycle stem, and wherein the removable handlebar cap is illustrated in position

adjacent the flange formed in the end of the stem. The flange and cap define the handlebar clamping portion for the stem in accordance with the present invention. The cap and flange provide a symmetrical arrangement to receive four threaded fasteners, such as bolts. This fastener arrangement provides high gripping strength, in a lightweight configuration. Portions of the cap are relieved to reduce weight without unnecessarily sacrificing strength.

FIG. 17, for example, illustrates the flange with the cap removed. The flange, because of its hollowed out structure, defines two spaced gripping surfaces for the handlebar. These spaced apart gripping surfaces contact the handlebar to resist torque applied by the rider. These spaced gripping surfaces also serve to accommodate slight bulges in the diameter of typical handlebars.

FIGS. 18-23 illustrate additional views of the bicycle stem in accordance with the present invention. Except for the removable cap and clamp, the bicycle stem (main portion) is preferably integrally formed of a monolithic body. The material may be aluminum, for example, for its relative low cost, low weight and sufficient strength characteristics. Of course, other metals, alloys, and materials, such as composites, for example, may also be used for the main body.

FIGS. 24-27 show additional details of the cap and representative dimensions therefor. In particular, the recess in the cap for contacting the handlebars includes an undercut portion to define respective edge gripping surfaces.

FIGS. 28-30 show additional details and give representative dimensions for another embodiment of the clamp as discussed above. In this embodiment it can be seen that the wings of the halves extend past the halfway point on an imaginary circular cylinder defined

by the halves. This can provide an even more uniform distribution of the force on the steering tube. Other shapes are also contemplated by the invention.

FIGS. 31-33 show dimensions and features of yet another clamp embodiment.

Lastly, FIGS. 34-36 show dimensions and features of the main body portion of the bicycle stem.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.